

REMARKS

Claims 1 through 10 are pending in this application. The title has been changed as requested by the Examiner and the specification has been amended to address manifest clerical oversights. In addition, claims 9 and 10 have been amended to address perceived antecedent basis issues. Applicants submit that the present Amendment does not generate any new matter issue.

A clean copy of the title, paragraphs of the specification affected by the present Amendment and of claims 9 and 10 appear in the Appendix hereto.

Clarification of Record

Applicants would solicit the Examiner to clarify the record by acknowledging the claim for priority pursuant to 35 U.S.C. §119 and receipt of the certified priority document filed in parent Application Serial No. 09/391,388 on September 8, 1999.

Title Change

The Examiner required a new title descriptive of the present invention. In response the title has been changed consistent with the Examiner's request.

Not accepted

Claims 3 through 5, 9 and 10 were rejected under the second paragraph of 35 U.S.C. §112.

In the statement of the rejection, the Examiner asserted that "said conductive layer" is ambiguous as to whether it refers to the first, second, or third conductive layers. This rejection is traversed.

Applicants would initially note that claims 3 through 5 depend from claim 1 wherein only a single conductive layer is mentioned--not first, second or third conductive layers. Ergo, one having ordinary skill in the art would have no difficulty understanding the scope of the invention defined in claims 3 through 5, particularly when reasonably interpreted in light of and in consistent with the written description of the specification.

Claims 9 and 10 have been amended to address the perceived antecedent basis issues mentioned by the Examiner thereby overcoming the stated basis for the imposed rejection. Applicants stress that one having ordinary skill in the art would have no difficulty understanding the scope of any claim, when reasonably interpreted in light of and consistent with the written description of the specification, which is the judicial standard. *Miles Laboratories, Inc. v. Shandon, Inc.*, 997 F.2d 870, 27 USPQ2d 1123 (Fed. Cir. 1993).

Applicants, therefore, submit that the imposed rejection of claims 3 through 5, 9 and 10 under the second paragraph of 35 U.S.C. §112 is not viable and, hence, solicit withdrawal thereof.

Claims 1 and 3 through 5 were rejected under 35 U.S.C. §103 for obviousness predicated upon the acknowledged prior art (Figs. 18 through 20 and pages 1 and 2 of the written description of the specification) in view of Arao et al.

In the statement of the rejection, the Examiner admitted that the acknowledged prior art does not disclose a semiconductor device comprising a conductive layer with a recess having sidewalls spaced apart by a difference that becomes smaller in the direction toward the semiconductor substrate. The Examiner, however, concluded that one having ordinary skill in the art would have been motivated to modify the acknowledged prior art semiconductor device by forming the recess so that the side surfaces become closer in the direction toward the substrate in view of Arao et al. This rejection is traversed.

In imposing a rejection under 35 U.S.C. §103, the Examiner is required to make a "thorough and searching" factual inquiry and, based upon that factual inquiry, explain **why** one having ordinary skill in the art would have been realistically motivated to modify particular prior (in this case the acknowledged prior art) to arrive at a claimed invention. *In re Lee*, 237 F.3d 1338, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002); *Teleflex Inc. v. Ficosa North America Corp.* __F.3d__, 63 USPQ2d 1374 (Fed. Cir. 2002). That burden has not been discharged.

argu Specifically, it should be apparent that Arao et al. do not even relate to a semiconductor device. Rather, Arao et al. are directed to a solar cell wherein irregularities are **intentionally formed in the surface for optical purposes**. Applicants emphasize that the device and objectives of Arao et al. are quite different from the acknowledged prior art semiconductor device where surface irregularities not desired.

Indeed, the present invention addresses and solves problems attendant upon forming undesirable surface regularities. That problem does not exist in Arao et al. Rather, surface irregularities are desired. This being the case, it is **not** apparent and the Examiner has **not** provided the requisite factual basis upon which to predicate the conclusion that one having ordinary skill in the art would have arbitrarily extrapolated the teachings of Arao et al. with respect to a solar cell, where surface irregularities are **desired**, to the acknowledged prior art semiconductor device wherein surface irregularities are **not desired**. *In re Lee, supra*. Again, the requisite motivation requires clear and particular factual findings as to a specific understanding or specific technological principle which would have realistically impelled one having ordinary skill in the art to modify the acknowledged prior art to arrive at the claimed invention based upon facts--not generalizations. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 57 USPQ2d 1161 (Fed. Cir. 2000); *Ecolochem Inc. v. Southern California Edison, Co.* 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000).

Further, the undesirable recess in the acknowledged prior art device is caused by ~~any~~ crystal grain boundaries. However, the intentional recesses of Arao et al. are not formed by crystal grain boundaries. This significant difference further undermines the notion that one having ordinary skill in the art would somehow have been realistically impelled to extrapolate the teachings of Arao et al to the acknowledged prior art semiconductor device wherein unwanted recesses are caused by crystal grain boundaries.

As previously pointed out, the present invention addresses and solves problems attendant upon irregularities formed by crystal grain boundaries. This problem is not even on the radar screen of Arao et al. who desire surface irregularity. Under such

circumstances, the problem addressed and solved by the claimed invention must be given consideration as an indicium of **nonobviousness**. *North American Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 28 USPQ2d 1333 (Fed. Cir. 1993); *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 15 USPQ2d 1321 (Fed. Cir. 1990); *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989).

It should, therefore, be apparent that a *prima facie* basis to deny patentability to the claimed invention has not been established. Moreover, upon due consideration to the problem addressed and solved by the claimed invention, the conclusion appears inescapable that one having ordinary skill in the art would **not** have found the claimed invention **as a whole** obvious within the meaning of 35 U.S.C. §103. *Jones v. Hardy*, 727 F.2d 1524, 220 USPQ 1021 (Fed. Cir. 1984).

Applicants, therefore, submit that the imposed rejection of claims 1 and 3 through 5 under 35 U.S.C. §103 for obviousness predicated upon the acknowledged prior (Figs. 18 through 20 and pages 1 and 2 of the written description of the specification) in view of Arao et al. is not factually or legally viable and, hence, solicit withdrawal thereof.

Claims 2 and 6 through 10 were rejected under 35 U.S.C. §103 for obviousness predicated upon the acknowledged prior art in view of Arao et al. and Jung et al.

In the statement of the rejection, the Examiner asserted that Jung et al. disclose the formation of small aluminum grains with low temperature deposition. The Examiner then concluded that the claimed invention would have been obvious. This rejection is traversed.

Applicants again submit that the Examiner did not establish a *prima facie* basis to deny patentability to the claimed invention under 35 U.S.C. §103 for lack of the requisite motivational element. *Teleflex Inc. v. Ficosa North America Corp.*, *supra*; *In re Lee*, *supra*. As previously pointed out, the present invention addresses and solves problems attendant upon the formation undesirable surface irregularities caused by crystal grain boundaries. On the other hand, Arao et al. do not relate to a semiconductor device, but to a solar cell. Arao et al. **intentionally form** irregularities in the surface for optical purposes. Thus, the device and objectives of Arao et al. are **quite different** from those of the acknowledged prior art semiconductor device wherein surface irregularities are not desired. Further, the recesses in the devices disclosed by Arao et al. and Jung et al. are not caused by crystal grain boundaries. This significant difference undermines the notion that one having ordinary skill in the art would somehow have been realistically motivated to modify the acknowledged prior art by impressing the teachings of Arao et al. and Jones et al.

Further, Applicants submit that the problem addressed and solved by the claimed invention, i.e., undesirable surface irregularities due to crystal grain boundaries, are not appreciated or addressed by either of the secondary references to Arao et al. and Jung et al. Accordingly, the problem addressed and solved by the claimed invention merits consideration as an indicium of **nonobviousness**. *North American Vaccine, Inc. v. American Cyanamid Co.*, *supra*; *Northern Telecom, Inc. v. Datapoint Corp.*, *supra*; *In re Newell*, *supra*.

It should, therefore, be apparent that a *prima facie* basis to deny patentability to the claimed has not been established. Moreover, upon giving due consideration to the

problem addressed and solved by the claimed invention, the conclusion appears inescapable that one having ordinary skill in the art would **not** have found the claimed invention **as a whole** obviousness within the meaning

It should, therefore, be apparent that the imposed rejections have been overcome and that all pending claims are in condition for allowance. Accordingly, favorable consideration is solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPENDIX

The new title reads as follows:

SEMICONDUCTOR DEVICE

Page 9, the paragraph beginning at line 1 reads as follows.

Titanium nitride film 3 has a thickness of about 100 nm. A thickness of low-temperature aluminum film 4 including polycrystalline aluminum is about 150 nm and has an average crystal grain size of about $0.5\mu\text{m}$. High-temperature aluminum film 5 is formed on low-temperature aluminum film 4. A thickness of high-temperature aluminum film is about 200 nm. High-temperature aluminum film 5 includes polycrystalline aluminum and has an average crystal grain size of about $1.5\mu\text{m}$. An opening 7 is formed as a recess in a surface of high-temperature aluminum film 5.

Page 11, the paragraph beginning at line 6 now reads as follows.

Low-temperature aluminum film 21 is formed over recess 6. Low-temperature aluminum film 21 has a thickness of 100 nm and an average grain size of $0.1\mu\text{m}$. A distance between side walls 6a and 6b of recess 6 becomes large as closer to silicon substrate 1. An anti-reflection film 22 having two layers of titanium and titanium nitride is formed on low-temperature aluminum film 21.

IN THE CLAIMS:

9. (Amended) The semiconductor device according to claim 6, wherein each of said first, second and third conductive layers includes aluminum.

10. (Amended) The semiconductor device according to claim 6, further comprising an insulating layer formed on said semiconductor substrate and a barrier layer formed on said insulating layer, said first conductive layer being formed on said barrier layer.